

Disruptive Challenges and Accelerating Force Transformation

By TERRY J. PUDAS

The Department attempts to compete on the very best capabilities. I say let's compete on the basis of cost and cycle time. . . . Learning rate turns out to be a great competitive advantage and allows the Department to move forward. Information gets shared more broadly, as we compete on time, and performance will actually go up.

—Vice Admiral Arthur K. Cebrowski, USN

Aerospace Relay Mirror System undergoing tests at Kirtland Air Force Base

Broadening military capabilities—that is, improving and changing at faster rates than our potential competitors—is a key objective of U.S. defense strategy and the military transformation process. The ability to maintain a competitive advantage depends not only on the Nation's manpower, fiscal resources, industrial capacity, and technology prowess, but also on the ability to outthink and outlearn adversaries, thereby making it more difficult for them to design and build military capabilities that threaten the United States and its allies.

In information age operating environments, where rapid change and ambiguity are the norm, this competitive advantage often depends on the availability of multiple effective options.¹ If U.S. military forces can accelerate the rate of transformation to generate more actionable and effective options than potential opponents, narrow the range of potential successful actions that opponents believe are available to them, and maintain initiative by implementing effective options, then they will be able to impose overwhelming complexity on opposing decisionmakers.

While many Department of Defense (DOD) programs claim to be transformational, relatively few contribute to accelerating the transformation rate. The key to identifying programs and claims on resources that can accelerate the transformation rate and reduce or eliminate the threat of disruptive (and other) security challenges depends on a common set of new metrics, including *generating higher transaction rates* within and among U.S. forces, *achieving faster learning rates* by U.S. forces, *creating and preserving options* in military competitions, and *creating overmatching complexity* in relation to adversaries or would-be adversaries.

The Four Security Challenges

The conceptual core of U.S. defense strategy rests on the four security challenges described in the 2005 *National Defense Strategy* (NDS): traditional, irregular, catastrophic, and disruptive.² In turn, the NDS provided an essential strategic foundation for the conduct of the 2006 Quadrennial Defense Review (QDR). While acknowledging that U.S. military forces maintain significant advantages in

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traditional forms of warfare, the NDS argues that our enemies are more likely to pose asymmetric threats—including irregular, catastrophic, and disruptive challenges—to the United States and its multinational partners in the years ahead (see figure 1).

To “operationalize the *National Defense Strategy* . . . senior civilian and military leaders [within DOD] identified four priority areas” as the focus of the QDR: “defeating terrorist networks; defending the homeland in depth; shaping the choices of countries at strategic crossroads; and preventing hostile states and non-state actors from acquiring or using WMD [weapons of mass destruction].” Figure 2 illustrates the ongoing shift within DOD to the type of capabilities and forces needed to address irregular, catastrophic, and disruptive challenges, while maintaining those capabilities and forces required to deal with traditional challenges.³

The four security challenges are interrelated. Equally important, none of the four challenges is subordinate

Four Security Challenges

Traditional

challenges posed by states employing recognized military capabilities and forces in well understood forms of military competition and conflict.

Irregular

challenges from those seeking to erode American influence and power by employing unconventional or irregular methods.

Catastrophic

challenges from adversaries seeking to paralyze American leadership and power by employing WMD or WMD-like effects in surprise attacks on critical, symbolic, or other high-value targets.

Disruptive

challenges from adversaries who seek to develop and use breakthrough capabilities to negate current U.S. military advantages in key operational domains.

to, or a lesser included case of another. All have important claims on resources because it is their interaction that poses the greatest national security challenge to the United States. This is a significant change to long-standing U.S. planning assumptions regarding priorities, resource allocation, and military requirements.

The NDS and the *QDR Report* emphasize the goal of broadening U.S. military capabilities, underlining the need to develop ways of meeting both present and future dangers quickly. Transformation is a necessary component of dealing with each of the four challenges. It has been difficult, however, to reach a consensus within DOD regarding the rate of transformation needed to cope with each of these challenges. While the Secretary of Defense and other senior leaders have consistently sought to increase the rate of force transformation, some have expressed caution, arguing that we cannot afford to increase the rate of transformation too dramatically as we fight the war

Figure 1



DO

2006 QDR Objective—Shift in Focus

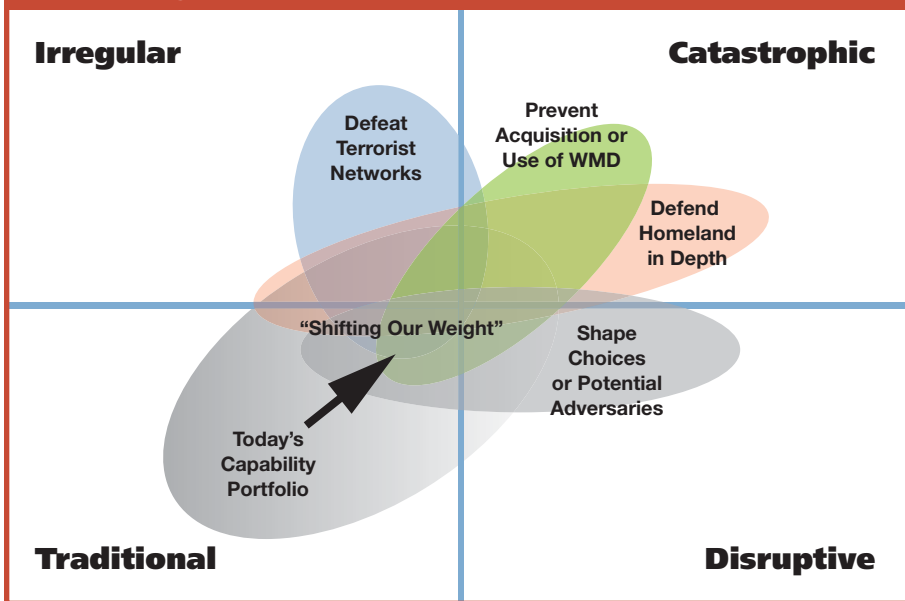


Figure 2

on terror and that the department might actually increase the risks to U.S. forces by going too fast. The current transformation rate represents a careful balance between benefit and risk in U.S. force planning.

Disruptive Challenges

Disruptive challenges refer to efforts by a military competitor—unanticipated by an adversary—to acquire breakthrough capabilities that could have potentially disastrous effects at the operational level of war when employed against the adversary.

These types of challenges against U.S. forces can occur on a traditional battlefield, during an insurgency, or when a terrorist group bent on attacking the U.S. homeland demonstrates that American forces cannot stop them before they launch an attack, counter the attack, or respond to it effectively. They normally originate from conscious competitive choice by an actual or potential military opponent. The architects of disruptive challenges seek to acquire the means of defeating our forces by neutralizing or avoiding U.S. military capabilities. Because the preponderance of American military strength is devoted to traditional categories of military power, disruptive challenges are unlikely to emerge from attempts to match or duplicate our strengths.

They are, instead, far more likely to be asymmetric by design. Also, those who seek to build them are likely to do so covertly because blatant efforts to create disruptive challenges increase the chances that the United States will anticipate them and build appropriate countermeasures or even eliminate the capacity of the opponent to build such a challenge before he can use it. Therefore, disruptive challenges are not cost-free to those who try to develop them, for they must develop both the technology or technique and the means of employing them under a heavy veil of secrecy.

The U.S. military has not had any recent experience with disruptive challenges. Not surprisingly, compared to our efforts to prepare our forces to deal with the other three security challenges—traditional, irregular, and catastrophic—we have not given much thought to the nature of disruptive challenges and how our forces can best prepare for them, although this may be changing as evidenced by a recent Navy initiative.⁴ Of course, U.S. military planners consider risks in operational planning, but largely in terms of what an opponent might do to try to prevent or slow the success of our planned operations.

Regardless of the scenario, our planners do not usually assume that our forces will be “swept off the battlefield” by an unanticipated

disruptive challenge. On the other hand, most planners recognize the limits to our ability to forecast how well actual operations will conform to the plan and readily acknowledge that even the best operational plans are unlikely to remain intact after the opening shots have been fired in the battle or campaign. In other words, U.S. military planners address the possibility of the unanticipated during the execution of plans and take into account the likelihood that things will not go as we expect, but they do not typically plan for disruptive challenges.⁵

Recent DOD efforts to develop effective ways of countering disruptive challenges have focused on how to dissuade potential opponents from attempting to develop them. These efforts generally address two approaches for countering disruptive challenges: narrowing the range of unanticipated events by better intelligence and building U.S. forces with the versatility to overcome a disruptive challenge if and when they confront one.

The first approach seeks to improve our ability to anticipate efforts by adversaries to develop and field capabilities that could have disruptive effects of their own. The second emphasizes greater force flexibility to adjust and respond more quickly to surprise. Successful efforts in both areas can create powerful dissuasive pressure on potential opponents. For example, an opponent attempting to develop a disruptive challenge to U.S. military capabilities may abandon the effort altogether if he believes U.S. intelligence has uncovered his secret plans. Similarly, if an adversary believes the U.S. military is sufficiently robust to shrug off or absorb a defeat at the operational level, he may decide that the cost of building a disruptive challenge is too great in the face of potential returns.

Despite their obvious potential to be effective, these two methods may not be sufficient to dissuade all prospective opponents from trying to present viable disruptive challenges to U.S. military forces. The competition that generates interest in developing disruptive challenges also generates political interests and bureaucratic momentum that can negate the dissuasive effects of better U.S. intelligence and a more robust, flexible U.S. military force. Such challenges may be addressed by a third

the four security challenges all have important claims on resources because it is their interaction that poses the greatest national security challenge

approach, accelerating transformation, in combination with the other two.

Accelerating Transformation

Although less widely understood than the two approaches described before, accelerating the rate of U.S. military transformation offers a third dimension for countering future disruptive challenges. In a broad sense, accelerating transformation is relevant to coping with all four security challenges, and its importance as a DOD goal is widely recognized—though not fully accepted by all. The 2006 *QDR Report*, for example, “provides new direction for accelerating the transformation of the Department to focus more on the needs of Combatant Commanders and to develop portfolios of joint capabilities” to support their requirements.⁶ In his initial guidance to the Joint Staff, General Peter Pace identified the need to “accelerate transformation” as one of his four “mutually supportive” priorities:

The goal of warfighting must be to produce a force capable of swiftly and decisively defeating any enemy. It is a prerequisite to winning the War on Terrorism and will significantly accelerate and be accelerated by transformation.⁷

Although accelerating the rate of transformation will help prepare our forces to be ready to dissuade, deter, and defeat all types of security challenges, it is logically tied most directly to meeting future disruptive challenges, where it forms the third focus of a strategic response. It has the potential to multiply the dissuasive effects of improved intelligence and enhanced force flexibility while adding a powerful additional element (see figure 3).

Accelerating the rate of transformation makes the U.S. military less of a fixed strategic target. Because disruptive challenges to U.S. military power emerge from efforts to target U.S. vulnerabilities or neutralize U.S. strengths, increasing the rate at which we reduce the former and enhance the latter will make it harder for a competitor to come up with an effective disruptive capability. By the time the adversary produces what he hopes will be a disruptive challenge, the target will have changed. Unless the competitor has accurately predicted where the U.S. military will be going by the time he has developed a disruptive capability, the U.S. vulnerability may have been eliminated or at least significantly reduced.

Countering Disruptive Challenges

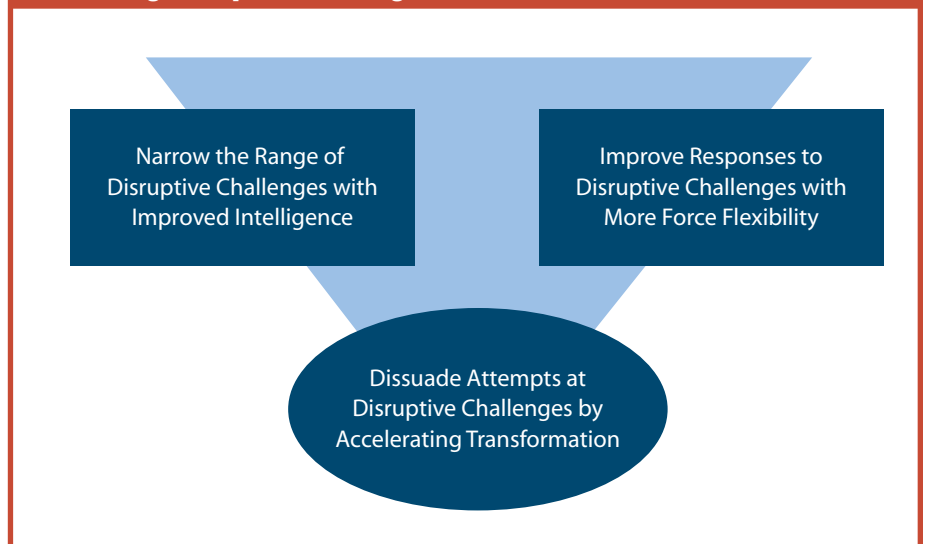


Figure 3

Broadening U.S. Military Capabilities

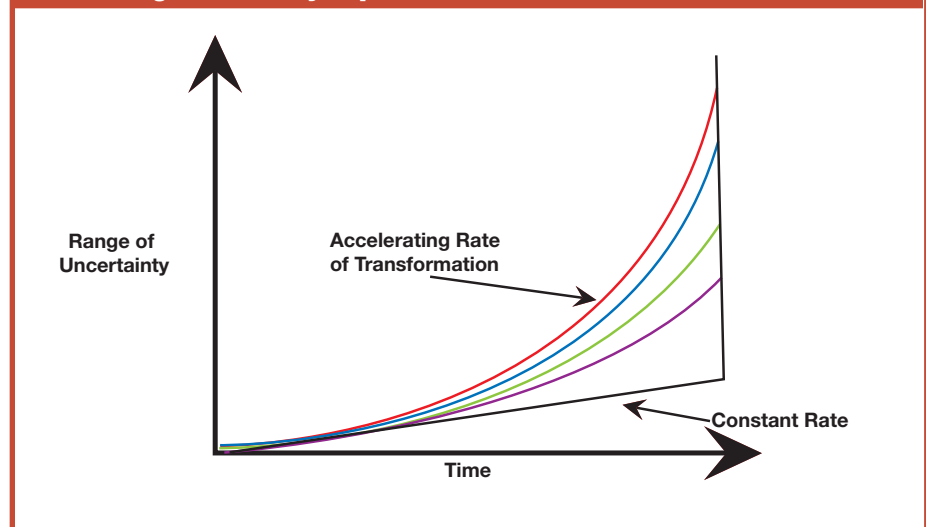


Figure 4

accelerating transformation is logically tied most directly to meeting disruptive challenges, where it forms the third focus of a strategic response

Broadening U.S. military capabilities—improving and changing at faster rates—also makes it more difficult for a competitor to devise something that will be disruptive to U.S. military power in the future because an increasing rate of transformation widens the range of potential future U.S. military capabilities (see figure 4). From the challenger’s perspective, this expands the area of uncertainty he faces in his efforts to predict

what will disrupt U.S. military forces in the future. Instead of a target that is predictable from straight-line projection, a competitor must hedge his bets as to what the U.S. military will be able to do in the future. He must devise optional development paths to counter the multiple possibilities that a faster U.S. military transformation process is capable of generating.

In sum, a faster rate of U.S. military transformation will make it harder for an opponent to devise disruptive challenges, which are likely to be more expensive to develop and more difficult to keep hidden. It reduces the competitor's confidence that what he hopes will disrupt U.S. military operations will actually work and increases the risk that

even necessary description in the continual competition between the Services and other DOD organizations for limited resources.

Over the past 5 years, Secretary Rumsfeld has articulated several significant refinements to the meaning of transformation as the term is used inside DOD. First is the notion that transformation must result

associated with improvement. Second is that transformation means "significant improvement" that occurs relatively rapidly. This highlights the distinction between modernization, involving incremental, linear change, and transformation, implying more radical, nonlinear change.

Transformation rate is the time it takes to change from one state or condition to another. The Secretary's qualitative description of "rapid, significant improvement" implies higher value to phenomena or activities that accelerate the rate of transformation. This distinction rests on the difference between claims of being "transformational" and claims of "accelerating the transformation rate." Both can increase the overall rate at which the U.S. military transforms, but they do so quite differently. Increases in transformation programs affect the rate of transformation in an additive way; in theory at

some DOD activities impact multiple transformation programs and thus accelerate the rate of transformation in a nonlinear way

the United States will discover his efforts to develop the disruptive capability. In a strategic sense, this shifts the complexity of the interaction between the United States and a competitor to the competitor. It lessens, but does not eliminate, the complexity that America faces in trying to discern what could be disruptive to its military capabilities and increases the complexity facing a competitor in trying to develop something that will disrupt U.S. capabilities by the time his planned disruptive challenge will be ready to use. The net effect of faster transformation multiplies the dissuasive pressure on the competitor.

Deceptive Terms

Transformation and *transformation rate* are deceptively simple terms, but they must be used with care. Nearly all definitions of transformation found in dictionaries include the concept of change from one state or condition to another, but little more. The various meanings of transformation say nothing about the results of the change, whether it is for the better or the worse, or at what rate it occurs.

The ambiguity of the word *transformation* is almost certainly one of the reasons it replaced the earlier phrase, *revolution in military affairs* (RMA) in DOD. RMA connoted rapid, radical, and uncontrolled change—an uncomfortable notion for many military professionals. Because of its more limited and ambiguous implications, transformation had the consensus-building advantage of embracing a much wider range of programs, plans, and tools. Since there is virtually nothing inside the Department of Defense that is not changing (rate and direction aside), virtually every program can claim to be transformational. This is convenient when *transformational* is understood as a helpful or

in tangible improvements. Thus, military transformation refers to changes from a lower to a higher state of military quality, in which *quality* can refer to military effectiveness, capability, efficiency, or other concepts

Arrow-2 antiballistic missile launches to intercept incoming target missile as part of a joint U.S.-Israel test program



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The Stiletto is being developed for the Navy

DOD

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least, the more transformational programs there are, the faster the rate of transformation. But this describes a linear increase, a function of the sum of transformational programs.

Some DOD activities have the potential to impact multiple transformation programs and, in so doing, accelerate the rate of transformation in a nonlinear way. Spiral development, for example, can accelerate the introduction of a broad range of transformational programs to U.S. forces. It accelerates the rate of transformation because it is designed to reduce the time required to move new technology into an operational status and to ensure that the organization and structures that can best take advantage of it are in place when it arrives.

Similarly, concept development and experimentation can accelerate the transformation rate by identifying and exploring new ways of using emerging technology and combining new or existing technology with new concepts of operations. Discontinuous technology can produce “skip generation weapons” and other systems designed and procured specifically to stimulate faster transformation by demonstrating and forcing new operational approaches and capabilities.

Education, training, combat experience, and other activities involving DOD person-

nel can help change the culture within the department, moving it away from industrial age assumptions to the new assumptions and characteristics of the information age. The implementation of network-centric capabilities within U.S. forces and the adoption of network-centric operational concepts offer the potential to accelerate the rate of transformation and contribute to countering future disruptive challenges.

Achieving Higher Learning Rates

As mentioned previously, generating higher transaction rates and achieving faster learning rates are two of the four new metrics that ought to be used to assess future military capabilities and identify programs that are contributing (or can potentially contribute) to accelerating the rate of military transformation.⁸ Together, they can help provide a foundation for accelerating transformation by creating and preserving viable options, which in turn can enable U.S. forces to impose overwhelming complexity on adversaries. By helping to accelerate the rate of military transformation, higher transaction and learning rates can help reduce or eliminate future disruptive challenges.

Transaction rate is the frequency of information exchanges among military

actors. It is a function of the communications architecture that defines who receives and sends messages. The greater the number of nodes in the network, the higher the number of information exchanges, at least potentially. More precisely, the transaction rate is a function of the streams of information that flow through the structure, the information (the content) that is carried by those streams, and the effect the information has on the actions of the actors (human or machine) that result from the interactions. The number of nodes on a network does not provide as reliable an indicator of the power of the network as the number, frequency, and content of the transactions that occur among the nodes. Most importantly, the transactions affect the understanding and behavior of their participants—they generate learning.

The ability to generate a higher rate of effective transactions than the opponent contributes directly to a higher learning rate for U.S. forces. In turn, the attainment of higher learning rates will help U.S. forces obtain a crucial advantage in creating and preserving viable options with greater probabilities of success. For military forces, learning in the battlespace or during an exercise is not simply a matter of conforming to the orders of higher authority. It involves continually assessing

Learning Rate

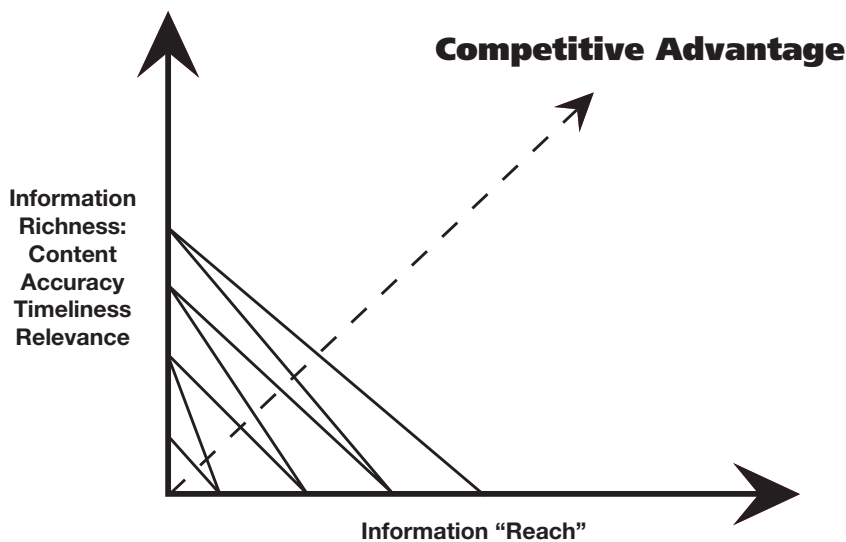


Figure 5

conduct experiments with operational prototypes, some aspects of the OFT experience thus far may be instructive.

The OFT intent is to increase experimental transaction rates to generate higher learning rates. In turn, this learning should enable DOD to produce investment options that can help U.S. forces adapt to an uncertain future. An option-based hedging strategy can be achieved by increasing numbers and diversity, creating a force relevant at various scales, and overmatching our competitors through investment and engagement. This strategy is specifically designed to create a more tactically stable force that values speed of maneuver and modularity for rapid configuration. Such a force will be capable of adapting to dynamic conditions and prevailing against all types of security challenges, including disruptive challenges. It is also a force where tactical learning is highly prized.

Tactical learning serves as a hedge against an adversary's cost-imposing strategy, such as terror, by generating a better understanding of a chaotic world at the appropriate scale for resolution. Controlling local chaos cannot be achieved from strategic distance; it must be accomplished by recognizing what is occurring at the relevant scale by local knowledge and experience. Tactical learning from operational experimentation also provides a means for gaining experience in critical operational mission areas without having to predict future mission or engagement areas. By deliberately experiencing as many operational options within the tightest cycle times possible, OFT aims to generate the best opportunity for organizational learning.

OFT has undertaken a number of concept-technology pairing initiatives that have shown promise by generating higher transaction and learning rates. In this regard, two OFT initiatives—the Wolf PAC distributed naval operations experiment and Project Sheriff, centered on the Full-Spectrum Effects Platform (F-SEP)—are especially promising.⁹

The Wolf PAC distributed naval operations experiment includes the development of the Stiletto craft as an operational “surrogate.”¹⁰ Stiletto, a composite fiber, nonmechanical dynamic lift high-speed vessel, represents one of the many assets that could be used for distributed naval operations in the future. Purposely designed to facilitate the investigation of the underlying rules for success and survival in complex maritime environments such as littoral waters, Stiletto's specific char-

orders in light of the current situation and providing feedback to those higher in the chain of command so that commanders or others in authority can alter their orders when the situation demands it or new opportunities are identified. This is the process that allows networked forces that maintain higher transaction and learning rates to adjust faster to rapidly changing combat situations.

The ultimate goal of a faster learning rate is a competitive advantage for U.S. forces. Attaining a high degree of information richness—including assessments of content, accuracy, timeliness, and relevance—will not alone assure a high learning rate. Instead, in order for learning rates to be increased, both information richness and information reach must be enhanced (see figure 5).

Increasing Learning Rates

The Office of Force Transformation (OFT) investigates and incubates emerging capabilities that have not been identified as requirements by the Services or combatant commands. Through these activities, OFT seeks to stimulate the changes needed to explore, develop, and experiment with concept-technology pairings. Furthermore, the office seeks to provide a positive path aimed at transforming the force through operational experimentation. While OFT is by no means the only DOD organization engaged in pairing concepts and technology to develop potentially transformational capabilities and

Testing flexible arm and leg protective armor



Office of Naval Research

*tactical learning serves as a
hedge against an adversary's
cost-imposing strategy,
such as terror*

acteristics incorporate modularity at multiple levels and use an "electronic keel" for rapid mission reconfiguration, which provides the necessary flexibility for special operations forces to deploy, modify, and tailor capabilities to deal with emerging challenges. In addition, the Wolf PAC initiative with Stiletto brings numerous options to the battlespace of the future, greatly increasing the complexity our adversaries will have to face.

Project Sheriff is another initiative that involves the application of the new metrics. It is focused on the critical urban environment where a unique concept/technology pairing has produced the F-SEP prototype. F-SEP is an integration of lethal and nonlethal systems, mounted on an Army Stryker wheeled fighting vehicle, which has the potential to provide Soldiers and Marines with a greatly expanded set of the options while simultaneously recapturing the time advantage. By applying rapid testing and experimentation techniques, Project Sheriff has helped accelerate the learning rate for this concept-technology pairing, allowing the exploration of even greater effectiveness in a more rapid fashion.

Although the U.S. military lacks recent experience in dealing with disruptive challenges in the battlespace, it appears quite possible, indeed likely, that we will face such challenges in the future, particularly if our adversaries decide that we are ill prepared to cope with them. Our intensified efforts to dissuade or counter disruptive challenges have relied on narrowing the range of unanticipated events that U.S. forces may face and building forces that are sufficiently robust and flexible to defeat disruptive challenges.

Accelerating the rate of transformation, moreover, dissuades disruptive challenges and shapes the choices of potential adversaries. In fact, it has the potential to multiply the dissuasive effects of improved intelligence and enhanced force flexibility. Ultimately, accelerating force transformation can make it far more difficult and expensive for adversaries even to develop effective disruptive challenges in the first place. **JFQ**

NOTES

¹ Arthur K. Cebrowski, "Transforming Transformation—Will It Change the Character of War?" unpublished paper (2004).

² DOD, *The National Defense Strategy of the United States of America*, March 2005, 2–3.

³ DOD, *Quadrennial Defense Review (QDR) Report*, February 6, 2006, 19.

⁴ Last year, the Chief of Naval Operations (CNO) established "Deep Red," an intelligence cell under the Director of Naval Intelligence (DNI), to provide a "devil's advocate" perspective to study "how adversaries might use available technologies in non-traditional ways, to disrupt operations." According to David Cattler, Deputy Assistant DNI for intelligence support and director of Deep Red, this organization was chartered in June 2005 by then Admiral Vern Clark "to inform the Navy on who its adversaries are, how they think, and how they might attack." Article by Geoff Fein in *Defense Daily*, January 20, 2006.

⁵ The 2005 Summer Study Task Force on Transformation convened by the Defense Science Board identified the potential of disruptive challenges as "a special category of capability concern," recommending that the department improve its capacity to detect disruptive technologies that adversaries could use to negate critical U.S. military capabilities like precision attack, dominant battlespace awareness, and decision superiority. "While the Task Force found extensive (DOD) activity in the area of disruptive challenges, it did not find a comprehensive, coherent effort to identify and address these challenges." *Defense Science Board (DSB) Summer Study on Transformation: A Progress Assessment*, Volume I (February 2006), 23.

⁶ DOD, *QDR Report*, February 6, 2006, 4.

⁷ Peter Pace, *The 16th Chairman's Guidance to the Joint Staff—Shaping the Future*, October 2005. The other three top priorities of the Chairman are to "win the war on terrorism," "strengthen joint warfighting," and "improve the quality of life of our service members and our families."

⁸ The other new metrics are "creating and preserving options" and "creating overmatching complexity."

⁹ Two other promising initiatives involving operational experimentation include the Operationally Responsive Space business model, which includes the Tactical Satellite experiments and two redirected energy efforts, the Aerospace Relay Mirror System and the Tactical Relay Mirror System.

¹⁰ The experimental Stiletto vessel was launched in December 2005 and revealed to the public for the first time in January 2006 at San Diego during the annual AFCEA West conference. Following U.S. Government acceptance in April 2006, the Office of Force Transformation began conducting a rigorous series of operational experiments that will define the broad range of utilities for a host of potential users.

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